U-SIT And Think News Letter - 24

Updates and Commentary

1 USIT – How to Invent
2 USIT – an Overview
3 Mini Lecture
4 Classroom Commentary
5 Problem-Solving Tricks and Related Miscellany
6 Feedback
7 Q&A
8 Other Interests

Unified **S**tructured **I**nventive **T**hinking is a problem-solving methodology for creating unconventional perspectives of a problem, and discovering innovative solution concepts, when conventional methodology has waned.

Dear Readers:

- Mini-lecture 24 continues a discussion of how to invent that was started in NL_21. Our topic is invention needed to improve customer perceived value in an existing product.

1. USIT – How to Invent: the USIT textbook.	$44.50
2. USIT – an Overview	FREE

3. Mini USIT Lecture – 24

"USIT – an Alternative Method for Solving Engineering-Design Problems"

Continuation of **How to Invent** …

Recap of Mini USIT Lecture 23
Having completed the table of characteristics, attributes, and functions inferred for our prototype drinking vessel, displaying my list of previously known drinking vessels, and then demonstrating two new concepts, I posed the question, "Where would you go from here?" So, where to next?

Methods for inventing
My industrial experience brought me into contact with consultants who use various techniques to lead teams in invention exercises. A common method involves telling a story. After seeing it done, I tried it with success. Teams are divided into small groups and assigned the task of composing a story involving objects needed to get from point A, through points B and C, on the way to point D. Each group is given realistic situations for these points, but different for each group: e.g., A = production plant, B = dentist's office, C = grocery store, and D = home. Each group is assigned a different problem to solve along the route: e.g., a flat tire, a long wait at a railway crossing, etc. Teams are not told what these exercises are for. After reading of each story before the assembled teams they are again divided and each given one of the stories (or original teams work of their own stories). The second exercise is to take the prototype product in need of invention and apply it in as many ways as possible in the assigned story. When it works, and it usually does, new concepts are discovered for the prototype product.

An interesting aspect of this method is the sudden break from focusing on the prototype product to a completely unrelated issue – inventing a story for an imagined set of conditions. Then follows the

enlightening exercise of using the prototype product to solve newly discovered problems. This exercise brings out the useful attributes of objects in the prototype product. Once these attributes are discovered, and what about them makes them fit the problem, the teams are on the way to yet newer inventions for the prototype product.

There are, of course, other methodologies for inventing. In my mind, the story-telling method succeeds by first finding a wholly new line of thinking to dwell on which also requires creative thinking. It succeeds secondly by bringing the problem solvers to a realization of their product's attributes that haven't been exploited.

One drawback of the story-telling method is the extended time involved with creating stories, reading them, critiquing them, and eventually inserting the prototype product into them and deducing new ideas. I now exhort the straightforward use of the table of characteristics, attributes, and functions (CAF table) for initiating innovative thinking. As we develop the table with only the prototype product under consideration, each new characteristic, attribute, and function discovered becomes an immediate seed to spark recall and suggest new invention concepts. It is a provocative and efficient process.

You have probably noted a basic difference in the story-telling method and creation of the CAF table. The former explicitly searches new product functions intuitively while the CAF table searches functions implied by discerned attributes – an immediate and crucial connection for innovation. Completing the CAF table challenges first creative insight in discerning attributes and then innovative projections for their potential functions. When completed the CAF table presents before us three different classes of prompts, to be taken in any order, to spark new ideas. They are the three columns of inferences composing the table. The CAF tool becomes less time consuming than story telling by assembling immediately useful information from which to seed innovative thinking.

Now I'll try to convince you of what I've just said.

Continuation of inventing new drinking-vessel concepts

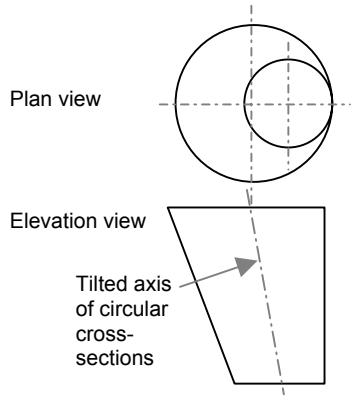
With the CAF table in hand we proceed to test every entry for its ability to spark new ideas in our minds. Skipping around the table is acceptable as long as each entry is addressed. Sometimes an entry that was unproductive will produce results on revisiting it after working with others. Some will not.

Our goal is to "list newly recognized functions for our product that could improve its perceived value" (p. 3/3, NL_21). References in the following, e.g., CAF1F1, refer to the CAF table, Characteristic 1, Function 1; namely, "to minimize depth of liquid at the sides of mouth preventing dribble while drinking".

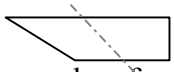
SCO3 [CAF1F1]: "preventing dribble while drinking". Extrude a short mouthpiece in the lid for sucking on. Any air leakage, a sign of potential dribble, would be subconsciously corrected by tightening closure of one's lips on the mouthpiece. This is similar to a known solution for children's drinking vessels. In this case, give the concept distinction by adding the feature of being able to fold the mouthpiece down onto the lid (so as to seal its passageway) between usages thus preventing accidental spillage.

SCO4 [CAF1F2]: "simplify blow-molding tools". (Blow molding is already capable of shapes more complex than our prototype product.)

[CAF1A1]: "circular cross-section in plan view (D_1 to D_2)". I just noticed an overlooked attribute – that the circular cross-sections are all concentric on a vertical axis of symmetry. In fact, the shape of our prototype-drinking vessel is a surface of revolution about its vertical symmetry axis. This observation sparks two contrarian views: what if $D_1 < D_2$, and what if the cross-section circles are concentric but their common axis is tilted or curved? The former was discussed in CAF2F3. Concentric circular cross-sections leads me first to a tilted axis of circular cross-sections (see sketch), then to the thought of circle centers lying on a spiral producing corkscrew-like novelty shapes, and then to all manner of artistic shapes including animals and other novelties with or without geometric lines for circle centers. These are previously known solutions.



The tilted symmetry axis suggests [SC05] a drinking vessel that could also be used as a serving scoop, and [SC06] with graduations a drinking vessel that also becomes a scoop for measuring desired volumes. Handles can be added in all cases.



Because the tilted axis brings the center of mass of the vessel closer to an edge of its base, it is more susceptible to tipping. This suggests reducing the tendency to tip by using a lower aspect ratio (height to width). Such a shape has a larger exposed surface-to-volume ratio for its contents than does one with larger aspect ratio. Therefore it enables more rapid heat loss from its contents – a vessel for cooling hot liquids.

It appears that drinking from a tilted, symmetry-axis vessel would be most convenient when lips are placed on its sloping side than on its vertical side. In the latter case the vessel would sooner make distracting contact with one's nose. This observation leads to the idea [SC07] of using a low aspect ratio vessel for serving small amounts of liquid to hospital patients who cannot lift their heads to a vertical position.

Appended CAF Table

#	Characteristics	Attributes	Functions (and associated unwanted effects, •/▪)
1	shape	• circular cross-sections in plan view (D_1 to D_2) • circles are concentric	• to minimize depth of liquid at sides of mouth preventing dribble while drinking, • to simplify blow-molding tools minimizing cost.
2		• trapezoidal cross-section in elevation view (shown above; $D_1 > D_2$) • axis of symmetry is a straight, vertical line • trapezoidal shape is a surface of revolution about the symmetry axis	• to ease removal from molding tools reducing defective parts, • to aid stacking, thus, minimizing storage space, • to reduce slippage when grasping (imagine grasping an inverted trapezoidal-shape container ($D_1 < D_2$).

[CAF2F2]: “to aid stacking” (nesting of trapozidal shapes). The prototype vessels we had in the classroom were stacked on the coffee and water service table. However, as a result of their light weight, tall stacks were easily toppled and it was necessary to use several smaller stacks. This brings to mind [SC08] to blow-mold vessels in close-packed groups with thin joining bridges to hold them together. These groups could be stacked higher than individual nested vessels. A top layer would be removed and individual vessels broken off as needed. Grouped vessels would be easier to handle in production than individual ones.

[CAF2F3]: “to reduce slippage when grasping”. An idea of closed pores [SC09] comes to mind to roughen the surface and improve grip to reduce slippage. Tiny pores within the thin vessel wall could be produced at blow-molding temperatures by evaporation or reaction of additives within the polymer producing small bubbles. This would have the additional advantage of increasing thermal resistivity making such vessels more comfortable to hold when containing hot or cold materials.

You are probably generating your own ideas from the CAF table contents as well as improvements of my ideas, and by new ideas you generate when you read these.

--

We will continue this exercise. I wonder what other attributes will be discovered. Perhaps you have discovered some that I have missed.

Note: The CAF table is a relatively recent idea that I am publishing here for the first time. I would be interested in your reactions to it.

****** To Be Continued in the next USIT Newsletter ******

5. Problem-Solving Tricks and Related Miscellany

6. Feedback Suggestions / corrections / etc.

7. Q&A Questions you would like to have discussed are welcome.

8. Other Interests

- Regarding inquiries about ordering the book, “Unified Structured Inventive Thinking – How to Invent”, details may be found at the Ntelleck website: www.u-sit.net. The cost of the book is US$44.50 plus shipping and handling. See the website for S/H charges. Send a check made out to **Ntelleck, LLC** for the proper amount, drawn on a US bank, to

Ntelleck, LLC, P.O. Box 193, Grosse Ile, MI 48138 USA

Please send your feedback and suggestions to Ntelleck@u-sit.net

To be creative, U-SIT and think.